CLAIMS

1. A plug for controlling fluid flow in a well bore, the plug comprising a substantially cylindrical body adapted for location on a work string, the body including a bore through a portion thereof and one or more radial ports for passage of fluid from the bore to an outer surface of the body, an actuating member moveable relative to the body so as to cover the one or more radial ports in a first position and uncover the one or more radial ports in a second position wherein movement of the actuating member is controlled by an actuating mechanism, the mechanism being operable under pressure in the well bore to set the plug in a first natural state wherein the actuating member is in the first position for a pressure under a predetermined pressure range; a second closed state wherein the actuating member is locked in the first position regardless of the pressure; and a third open state wherein the actuating member is moved to the second position on increasing the pressure to the predetermined pressure range and holding the pressure in the range for a predetermined time.

2. A plug as claimed in Claim 1 wherein the actuating mechanism comprises one or more pistons operated on by the applied pressure.

3. A plug as claimed in Claim 2 wherein the actuating mechanism comprises first and second pistons; the first piston including a damping element for delaying movement of the first piston relative to the second

piston under the applied pressure; the second piston acting on a retaining element; the retaining element adapted to hold the second piston in an intermediate position when the applied pressure is within the predetermined range and allow movement of the first piston to a final position; the retaining element allowing the second piston to move to a secondary position when the applied pressure is above the predetermined range; a locking element which prevents movement of the first piston when the second piston is in the secondary position; and a securing element for retaining the actuating member in the first position until released by virtue of the first piston reaching the final position, whereby the actuating member moves to the second position and opens the plug.

4. A plug as claimed in Claim 3 wherein the damping element is a fluid metering device.

5. A plug as claimed in Claim 3 or Claim 4 wherein the retaining element is a collet.

6. A plug as claimed in Claim 5 wherein the locking element is a sleeve such that the retaining element and the locking element engage to control movement of the pistons.

7. A plug as claimed in Claim 1 wherein the actuating mechanism may comprises a pressure sensor located in the bore to measure the applied pressure, a processor programmed to control a motor in response to the pressure wherein operation of the motor causes the

required relative movement between the actuating member and the body.

8. A plug as claimed in Claim 7 wherein the mechanism also comprises a securing element for retaining the actuating member in the first position.

9. A plug as claimed in any preceding Claim wherein the actuating member is a sleeve.

10. A plug as claimed in Claim 9 wherein the securing element is one or more locking keys which engage with the sleeve.

11. A plug as claimed in any preceding Claim wherein the predetermined range for the pressure is approximately 1200 to 1800 psi.

12. An actuating mechanism for operating a tool used in a well bore, the mechanism comprising first and second pistons; the first piston including a damping element for delaying movement of the first piston relative to the second piston under an applied pressure; the second piston acting on a retaining element; the retaining element adapted to hold the second piston in an intermediate position when the applied pressure is within a predetermined range and allow movement of the first piston to a final position; the retaining element allowing the second piston to move to a secondary position when the applied pressure is above the predetermined range; a locking element which prevents movement of the first piston when the second piston is in the secondary position; an actuating

member whose movement operates the tool; and a securing element for retaining the actuating member in a first position until released by virtue of the first piston reaching the final position, whereby the actuating member moves to a second position and operates the tool.

13. An actuating mechanism as claimed in Claim 12 wherein the first and second pistons include substantially conical drive faces with apexes directed towards the applied pressure.

14. An actuating mechanism as claimed in Claim 12 or Claim 13 wherein the damping element is a fluid metering device.

15. An actuating mechanism as claimed in Claim 14 wherein the fluid metering device comprises a fluid filled chamber through which the first piston passes and a portion of the first piston includes a restrictor to regulate fluid flow between upper and lower compartments of the chamber.

16. An actuating mechanism as claimed in Claim 15 wherein a pressure balance piston is located in the chamber, around the first piston so as to control the size of the chamber in order to compensate for thermal effects and pressure differences between inside and outside the chamber.

17. An actuating mechanism as claimed in any one of Claims 12 to 16 wherein the retaining element is a spring.

18. An actuating mechanism as claimed in Claim 17 wherein retaining element is a collet.

19. An actuating mechanism as claimed in any one of Claims 12 to 18 wherein the locking element is a sleeve such that the retaining element and the locking element engage to control movement of the pistons.

20. An actuating mechanism as claimed in any one of Claims 12 to 19 wherein the actuating member is a sleeve and the securing element is one or more locking keys which engage with the sleeve.

21. A method of controlling fluid flow in a well bore, the method comprising the steps:

(a) locating a plug in a well bore, the plug including an actuating mechanism to operate the plug;
(b) increasing pressure from a surface of the well bore to within a predetermined range; and
(c) keeping the pressure within the predetermined range over sufficient time to cause the actuating mechanism to move and open the plug.

22. A method of controlling fluid flow in a well bore as claimed in Claim 21 wherein the plug is as claimed in any one of Claims 1 to 11.

23. A method of controlling fluid flow in a well bore as claimed in Claim 21 or Claim 22 wherein the method

includes the step of applying pressure above the predetermined range.

24. A method of controlling fluid flow in a well bore as claimed in any one of Claims 21 to 23 wherein the method includes the step of locking the plug in a closed position in the event that the pressure exceeds the predetermined range.

25. A method of controlling fluid flow in a well bore as claimed in any one of Claims 21 to 24 wherein the method includes the step of performing a pressure test above the plug.

26. A method of controlling fluid flow in a well bore as claimed in any one of Claims 21 to 25 wherein the method includes the step of bringing the pressure back down to below the predetermined range to then perform steps (b) and (c) to open the plug.